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THE ADOPTION
OF
A PRIME MERIDIAN
TO BE
COMMON TO ALL NATIONS.
THE ESTABLISHMENT OF STANDARD MERIDIANS
FOR THE
REGULATION OF TIME.
READ BEFORE THE
INTERNATIONAL GEOGRAPHICAL CONGRESS AT VENICE,
SEPTEMBER, 1881,
BY
SANDFORD FLEMING, C.M.G.,
DELEGATE FROM CANADA AND THE UNITED STATES OF AMERICA.

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INTERNATIONAL GEOGRAPHICAL CONGRESS,
VENICE.

PAPER ON
THE ADOPTION OF A PRIME MERIDIAN.

READ SEPTEMBER 21ST, 1881,

BY SANDFORD FLEMING, C.M.G.,

*Delegate from the Canadian Institute of Science, Toronto, and the American
Metrological Society, New York, to the International Geographical
Congress at Venice.*

The subject to which, with your permission, I shall briefly refer, is the establishment of a Prime Meridian and Time-zero, to be common to all nations.

The history of geographical science informs us that a great number of initial meridians have at various times been employed by astronomers and navigators. It is well known that Claudius Ptolemy of Alexandria was among the first to fix a meridian of reference. Ptolemy lived in the second century, when the habitable world was thought to be limited to countries around, or not far beyond, the shores of the Mediterranean. From time to time a knowledge of the earth's surface extended, and distinguished geographers arose, who adopted new initial meridians. It is not necessary that I should trouble you with a recital of the list of meridians from which, since the earliest period, longitudes have been reckoned. It is sufficient at this stage to refer to the fact that geographers of different nations have generally selected for starting points places of importance well known to them,

and that, as a rule, they have chosen the capitals or the principal observatories of the nations to which they respectively belonged. Hence the multiplication of meridians of reference throughout the world. Within a comparatively recent period communications between the peoples of different nations have been greatly facilitated, and intercourse has proportionately increased. It has consequently been felt that the variety of first meridians is embarrassing and unnecessary. For a number of years the question of reducing this number has been under consideration; it has been brought before the geographical congress at Antwerp, and again at Paris. The question has been examined by different societies, and various proposals have been submitted, but unanimity with respect to the selection of a prime meridian to be common to all nations has in no way been attained. Repeated efforts have been made to gain general concurrence to the adoption of one of the existing national meridians, but these proposals have tended to retard a settlement of the question by awakening national sensibilities, and thus creating a barrier difficult to remove. Other proposals to select an entirely new initial line, unrelated to any one of the first meridians at present recognized, have but little advanced the settlement of the question, as such a course encounters difficulties of another kind, difficulties so serious in their character as to render the proposals almost impracticable.

There are reasons for a unification of first meridians which every year become stronger, and, as the question affects the whole area of civilization, its consideration should be approached in a broad, liberal spirit. While it may be urged that the selection of any particular meridian is less important than the adoption of a common first meridian, care should be taken to consider the interests of all people concerned or likely to be concerned, scrupulously avoiding offence to local prejudice or national vanity. On every account it is extremely

desirable that an earnest effort should be made to seek for a solution to the problem.

The unification of initial meridians has been advocated in the interests of geography, astronomy and navigation. I shall accept all the arguments which have been advanced on behalf of these extremely important interests, and crave your indulgence while I submit additional reasons for the establishment of a common prime meridian for all the world.

I propose to direct your attention to arguments which spring from the relations of time and longitude and the rapidly growing necessity in this age for reform in time-reckoning.

If we take into view the whole earth, we have at the same instant in absolute time, noon, midnight, sunrise, sunset, and all intermediate gradations of the day. The telegraph system, which is gradually spreading like a spider's web over the surface of the globe, is practically bringing this view of the sphere before all civilized communities. It leaves no interval of time between widely separated places proportionate to their distances apart. It brings points remote from one another, enjoying all the different hours of daylight and darkness, into very close contact. Under our present system of notation, confusion is developed, and all count of time is thrown into disorder.

The local civil day begins twelve hours before and ends twelve hours after the sun passes the meridian of a place. As the globe is constantly revolving on its axis, a fresh meridian is every moment coming under the sun. As a consequence, a day is always beginning somewhere and always ending somewhere. Each spot around the circumference of the sphere has its own day, and therefore there are, during every diurnal revolution of the earth, an infinite number of local days, all beginning within a space of twenty-four hours, and each continuing twenty-four hours. These days overlap each

other, and, theoretically, they are as perfectly distinct as they are infinite in number. There are no simultaneous days except on the same meridian, and as the different days are always in the various stages of advancement, difficulties must necessarily result in assigning the period when an event takes place. The telegraph may give the exact local time of the occurrence, but it will be in disagreement with the local times on every other meridian around the earth. An event occurring any one day may on the instant be announced somewhere the previous day, or somewhere else the following day. About the period when one month or year passes into another month or year an occurrence may actually take place in two different months, or in two different years, according to local reckoning.

It will be readily conceded that this system is extremely unscientific; that it possesses all the elements of confusion, and produces a degree of ambiguity which cannot long be tolerated; that as time rolls on it will lead to grave complications in social and commercial affairs; that it will produce serious errors in chronology; that it will lead to litigation, and result generally in difficulties of various kinds. According to our present system there can be no absolute certainty with regard to time unless the precise geographical position be specified as an important element of the date. It is evident that it will be exceedingly inconvenient and troublesome when rapid intercourse becomes universal to bring the times of different countries and localities into agreement; and that the necessity for doing so by additions or deductions for differences in longitude, will undoubtedly clog the ordinary business of the world.

It is proposed to obviate the difficulty by a system of cosmopolitan time-reckoning, the chief peculiarity of which is the adoption of one particular meridian as a standard time-zero, and by an extremely simple arrangement regulating the

times at all places on the globe by a direct reference to the common standard. It is obvious that the world's time-zero should coincide with the prime meridian to be used in common by all nations for reckoning terrestrial longitudes.

I shall proceed to submit special and more urgent reasons for the selection of a common initial meridian and time-zero. I shall confine my observations to the case of North America, a country with which I am most familiar, but the remarks I shall venture to submit will doubtless apply to other great divisions of the earth's surface.

The gigantic system of railways and telegraphs which has been established in America, has developed social and commercial conditions which never previously existed in the history of the human race. These conditions have affected the relations of time and distance, in a manner which shows, that the system of notation which we have inherited is defective; that it leads to confusion, causes loss of time, and disturbs the arrangements of travellers and business men; that it frequently results in loss of life, and leads to difficulties of various kinds; that under the circumstances which have followed the extensive employment of steam and electricity as means of rapid communication, it is generally inappropriate.

This question has therefore become a matter of great public importance, and attention is seriously directed to the simplest and best means of removing an impediment to commerce and general intercourse.

The system which we follow and which has been followed for ages was quite unobjectionable half a century ago, when the electric telegraph was unknown and the horse was almost the only locomotive. The system is based on the theory that time is regulated everywhere by the passage of the sun over the meridian of each separate locality; that the period between any two solar passages, at any one place, is

divided into halves, known as *ante-meridian* and *post-meridian*, each half being subdivided into twelve hours, and that the two halves together constitute a day.

According to the recognised theory, as already stated, every spot on the surface of the globe differing in longitude has an entirely distinct day, and a local time peculiar to itself. Except on the same meridian there are no simultaneous days, or hours or minutes. Everywhere the days and divisions of the day vary, and the variations are infinite.

In the case of North America the continent extends across one hundred and five degrees of longitude. Within its extreme eastern and western limits, it is possible to draw many thousand distinct meridians, and following rigidly the prescribed theory, we may have as many thousand standards of time, not two of which would be in harmony. The railway authorities have come face to face with the difficulty, and they have from time to time met it as circumstances dictated. In order to operate the long lines of railway with some degree of safety, each separate manager has been obliged to ignore the different local times, and arbitrarily adopt a special time for the movement of trains on the particular lines under his charge. The railway guide books publish at least seventy-five (75) irregularly chosen standards of time, employed for the running of trains in the United States and Canada. Every city and town of importance has its own time, occasionally coinciding, but frequently differing from the nearest railway standard. The public have been obliged to accommodate themselves to this irregular system but it has become exceedingly inconvenient and irksome, and a scheme which will introduce a time-system characterised by uniformity and simplicity cannot fail to be cordially welcomed.

For the reasons stated, an earnest movement has begun in America with the view of establishing reform in

time-reckoning. The question is engaging the attention of the Canadian Institute of Science, the American Meteorological Society, the American Society of Civil Engineers, the American Association for the Advancement of Science, and other Societies. The community generally and the great railway and telegraph interests are being awakened to its importance.

It is felt that the question is one in which all countries have an interest, and although it has presented itself, perhaps more prominently in America than elsewhere, it is eminently desirable that Americans should take no narrow view of a scientific matter of world-wide interest.

It is held by those who have seriously considered the subject, that a solution of the problem which would be good for America would be advantageous to other countries. It is considered, that in introducing a reform in time-reckoning in North America, the system should be such as would commend itself generally; that it should be one which by its appropriateness and simplicity would have every prospect of being adopted ultimately throughout the world.

A highly important feature of the movement is to employ every means to render the system generally acceptable, so that, whenever the necessity may arise in any other community for its introduction, it may be spontaneously adopted; a course calculated to secure ultimately complete uniformity in all countries.

I shall give in brief an outline of a proposition for defining and regulating civil time which is favoured in many quarters, in Canada and the United States of America :—

1. It is proposed to establish one standard time which may be common to all people throughout the world, for communication, by land and sea, for all ordinary purposes, for synchronous observations, and for all

scientific purposes. This standard time to be known as *Cosmopolitan time*.

2. Cosmopolitan time to be based on the diurnal revolutions of the earth as determined by the (mean) sun's passages over one particular meridian to be selected as a time-zero.

3. The time-zero to coincide with the prime meridian to be common to all nations for computing longitude.

4. The time-zero and prime meridian for the world to be established with the concurrence of civilized nations generally.

5. Twenty-four secondary or standard hour meridians to be established, fifteen degrees or one hour distant from each other, the first being fifteen degrees from the prime meridian.

6. The standard hour meridians to regulate time at all places on the earth's surface.

7. The twenty-four standard meridians to be denoted by symbols, and, preferably, by the letters of the English alphabet, which omitting J and V are twenty-four in number. The letters to be taken in their order from east to west. The zero-meridian being lettered Z.

8. The hour of the day at any place on the earth's surface to be regulated by some one of the standard meridians, generally by the standard nearest such place in longitude.

9. It is proposed to distinguish that interval of time between two consecutive passages of the (mean) sun over the prime meridian by the term, *Cosmopolitan day*.

10. The cosmopolitan day is designed to promote exactness in chronology, and is intended to be employed in connection with synchronous observations in all parts of the world, and for scientific purposes generally.

11. Local days to commence twelve hours before and

end twelve hours after the (mean) sun's passage over each of the standard meridians. The local days to be distinguished by the letters of the twenty-four meridians which determine them.

12. Local days will be reduced to twenty-four in number within the period of each diurnal revolution of the earth. They are to be regarded in the same light in all ordinary affairs as local days under the present system.

13. The hours of the *Cosmopolitan day* to be known by the letters of the Alphabet in their order from A to Z (omitting J and V,) corresponding with the twenty-four hour meridians. When the (mean) sun passes meridians G or N, it will be G time or N time of the *Cosmopolitan day*.

14. It is proposed to abandon the divisions of the local day into two sets of hours, each numbered from one to twelve, and to employ a single series numbered from one to twenty-four without interruption; or as an alternative plan to number the twelve hours from midnight to noon, as at present, and to letter the hours from noon to midnight. The afternoon letters being in agreement with the proper *Cosmopolitan time letters*.

15. The time determined directly from the prime meridian, as in the *Cosmopolitan day*, to be known by the general term *Cosmopolitan Time*.

16. Local time to be known by the particular standard meridian to which it is referred. If it be determined by meridian B it will be designated *Standard B Time*.

17. It is proposed to have standard time determined and disseminated under Governmental authority.

18. Each city and town of importance to have a public time signal station electrically connected with a

central observatory for the purpose of receiving and disseminating standard time with precision.

19. Each time signal station to be provided with automatical apparatus for dropping time balls, or otherwise denoting the standard time, hourly, or as often as circumstances may require.

20. All railway and local public clocks to be controlled electrically from the public time signal stations.

The foregoing is a general outline of the proposition. It must be evident that the system of cosmopolitan time would be a ready means of meeting the difficulties to which I have referred. It would render it practicable to secure uniformity, great simplicity, perfect accuracy, and complete harmony. The times of places widely differing in longitude would differ only by entire hours. In all other respects standard time in every longitude, and latitude would be in perfect agreement. In theory every clock in the world would indicate some one of the twenty-four hours at the same instants, and there would be perfect synchronism with the minutes and seconds everywhere around the globe.

By the system proposed, instead of an infinite and confusing number of local days, following the sun during each diurnal revolution of the earth, we should have twenty-four well-defined local days only; each local day would have a fixed relation to the others, and all would be governed by the position of the sun in respect to the Prime Meridian. These twenty-four local days would succeed each other at intervals of one hour during each successive diurnal revolution of the globe. The day of each locality would be known by the letter or other designation of its standard meridian, and the general confusion and ambiguity which I have set forth as the consequences of the present system would cease to exist.

Some such system as that proposed is imperatively demanded in America. It cannot be doubted that the general adoption

of the scheme portrayed would be conducive to the convenience of all mankind. The first step towards its introduction is the selection of an initial meridian for the world. Accordingly I feel justified in asking you to favourably consider the resolutions which I have now the honour to submit.

RESOLUTIONS*.

Resolved—1. That the unification of initial meridians of reference for computing longitude is of great importance in the interests of geography and navigation.

Resolved—2. That the selection of a zero-meridian for the world would greatly promote the cause of general uniformity and exactness in time-reckoning.

Resolved—3. That in the interests of all mankind it is eminently desirable that civilized nations should come to an agreement with respect to the determination of a common prime meridian, and a system of universal time reckoning.

Resolved—4. That the Governments of different countries be appealed to immediately after the close of Congress, with

* The original Resolutions were as follows, viz. :—

Resolved—1. That the unification of initial meridians of reference for computing longitude is of great importance in the interests of geography and navigation.

Resolved—2. That the selection of a zero-meridian for the world would greatly promote the cause of general uniformity and exactness in time reckoning.

Resolved—3. That in the interests of all mankind it is eminently desirable that civilized nations should come to an agreement with respect to the determination of a common prime meridian.

Resolved—4. That a special committee be appointed to report to this Congress on the best means of obtaining the concurrence of civilized nations to the choice of a prime meridian.

On consultation with the other Delegate from America, present in Venice, these resolutions were amended and submitted as above.

the view of ascertaining if they would be disposed to assist in the matter by nominating persons to confer with each other and endeavour to reach a conclusion which they would recommend their respective governments to adopt.

Resolved—5. That in view of the representations which have come to this Congress from America, it is suggested that a Conference of Delegates who may be appointed by the different governments be held in the city of Washington, and that the Conference open on the first Monday in May, 1882.

Resolved—6. That the gentlemen whose names follow be an Executive Committee to make arrangements for the proposed Meeting of Delegates, and to take such steps as may seem expedient in furtherance of the objects of these Resolutions. And that all communications in respect thereof be transmitted to General W. B. HAZEN, Meteorological Bureau, War Department, Washington.

Dr. F. A. P. BARNARD, President of American
Metrological Society, New York.

Captain GEORGE M. WHEELER, Corps of
Engineers, U.S.A., Washington.

Chief-Justice DALY, President of the American
Geographical Society, New York.

Justice FIELD, Supreme Court, Washington.

General G. W. CULLUM, Vice-President,
American Geographical Society, New York.

General W. B. HAZEN, Director of Meteorological
Bureau, Washington.

Judge PEABODY, American Geographical
Society, New York.

Professor CLEVELAND ABBE, Signal Office,
Washington.

DAVID DUDLEY FIELD, American Geographical
Society New York.

JAMES B. FRANCIS, President, American Society of Civil Engineers, Boston.

Dr. DANIEL WILSON, President of Toronto University, Toronto.

JOHN LANGTON, President of the Canadian Institute, Toronto.

SANDFORD FLEMING, Chancellor of Queen's University of Canada, Ottawa.

Resolution 7.—That the Italian Government be respectfully requested to communicate these resolutions to the Governments of all other countries.

After full discussion, the Committee agreed to report favourably and recorded the following Minute.

(Translation.)

The Committee considers that within a year an International Commission may be appointed by the Governments, to consider the question of an Initial Meridian, having in view not only the question of longitude but specially that of hours and dates. The Commission should be composed of scientific men such as Geodicians, Geographers and men who represent the interests of commerce, etc. Three members might be named by each nation. The President of the Italian Geographical Society is requested to take the initiative in bringing the subject before his Government and foreign geographical Societies, and to take the necessary steps for the realization of the wish expressed in the resolutions. Without deciding, the Committee desires to draw attention to the proposition of the American Delegates that the proposed International Commission should meet at Washington.